DOCUMENT RESUME

ED 149 480 EA 010 300

AUTHOR	Pearson, Dennis A.; Goff, Clinton
TITLE	Portland Public Schools Burglary Prevention Project (73-DF-10-0104). Final Evaluation Report (No. 2).
INSTITUTION	Oregon State Law Enforcement Council, Salem.
SPONS AGENCY	National Inst. of Law Enforcement and Criminal Justice (Dept. of Justice/LEAA), Washington, D.C.
PUB DATE	Jul 77
GRANT	75-NI-10-0002
NOTE	77p.
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	*Alarm Systems; Attendance; Cost Effectiveness; Delinquent Identification; Demography; Elementary Secondary Education; *Prevention; Program Descriptions; Program Evaluation; Research Methodology; Research Problems; *School Security; *School Vandalism; Social Science Research; Statistical Analysis; *Stealing; Tables (Data)
IDENTIFIERS	*Portland Public Schools OR

ABSTRACT

This project was part of the Portland High Impact Program and had as its goal a 60 percent reduction in burglary losses over a three-year period to be attained by installing centrally-monitored, silent, anti-intrusion devices in eleven schools. Comparison with eleven control schools indicates that the alarm system has demonstrated effectiveness in reducing burglaries and property loss. The purpose of this final report is to describe the project in some detail and discuss the methodology used to collect the post-installation data, the rationale behind the comparisons and statistical tests employed, and the implications these findings have on the current project and on the design and implementation of similar burglary prevention projects in the future. A secondary analysis is presented that attempts to isolate the influence of certain demographic factors on burglary rates and their associated property loss. Of these, only the percentage of students attending school showed a significant association. (Author/MLF)

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PORTLAND PUBLIC SCHOOLS BURGLARY PREVENTION PROJECT

(73-DF-10-0104)

FINAL EVALUATION REPORT

(No. 2)

Prepared by the
OREGON LAW ENFORCEMENT COUNCIL

KEITH A. STUBBLEFIELD
ADMINISTRATOR

JULY, 1977

Prepared under Grant 75-NI-10-0002 from the National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, Department of Justice.
"Points of view or opinions stated in this document are those of the author and do not necessarily represent the official position or policies of the Department of Justice."

EA 010 300

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The Portland Public Schools Pilot Program to Reduce Burglary Related Property Losses was funded under Grant Number 73-DF-10-0104.

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SUMMARY OF FINDINGS

1. Based on the data analysis presented, but mindful of the inherent limitations of this quasi-experimental design, it appears that the alarm system has demonstrated effectiveness in reducing burglaries and property loss.

   Specifically, if the primary objective of the project (a 60 percent reduction in property loss after three years) is divided into three, one-year increments, then the obtained 42 percent reduction in property loss slightly surpasses the expected 40 percent reduction after two years.

   The secondary goal of a significant reduction in the frequency of burglaries was met. However, the effects of statistical regression may have been interacting, so that a portion of this reduction may be due to the tendency for extreme values to move toward less extreme values overtime, independent of any deliberate intervention.

   The third goal, a significant increase in apprehensions was defined in terms of clearance rates.[1] There was no significant difference in the clearance rates of the target schools between the pre and post-installation periods.

2. The efficiency of the system based on a two-year current data cost-benefit analysis and a ten-year projected cost-benefit analysis remains questionable.

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[1]Clearance rate is the percentage of total burglaries where at least one individual was arrested for a burglary. If there are 100 total burglaries, of which 39 were cleared by arrest, the clearance rate = .39.

Based on the total implementation costs plus on-going maintenance costs over the project period, minus the actual money saved in reduced property loss, the anti-intrusion system will be unable to "pay for itself" if the savings in property loss and maintenance cost differential remain at its current rate.

Based on the projected savings in net losses (those savings realized if the pre-installation trend in actual property losses would have continued) and current maintenance costs, the projected savings will exceed the costs of maintaining the alarms, but will not exceed the accumulated implementation and maintenance costs for several years to come. The exact number of years cannot be reliably predicted due to the variability of maintenance costs and net losses.

With the current and future expansion of the alarm system to include other schools, and with the addition of smoke and fire detection devices as an integral part of this centrally-monitored system, the actual cost-benefit analysis of the system could change appreciably.

3. There was a 27 percent reduction in burglary frequency in the target schools during the two-year post-installation period. (significant at $p<.05$)[2].

4. There was a 42 percent reduction in property loss due to burglaries in the target schools during the two-year post-installation period. This difference is not statistically significant due to the wide

---

[2]Statistical significance refers to the probability of a difference between two or more sets of values being due to chance alone, where $p<.05$=less than a five percent chance and $p<.01$ =less than a one percent chance.

variance in property loss and the small sample size; however, a drop of 42 percent in property loss would appear to be of considerable practical significance.

5. The value of property recovered declined by 61 percent in the target schools during this same time period. This decline is significant at $p<.005$. This decline probably resulted from the relatively early arrival of the police at the scene of burglaries after the alarms were installed, so that the property which would have been stolen if they arrived later was still within the building, thereby reducing both the value of property reported stolen and recovered.

6. The clearance rate increased by six percent in the target schools during the post-installation period. This difference is not statistically significant.

7. None of the post-installation differences in any of the above criteria measures (burglary frequency, property loss, property recovered and clearance rate) proved to be statistically significant in the control schools.

8. The control schools' burglary frequency declined by 11 percent, whereas the target schools declined 27 percent.

9. The control schools' property loss <u>increased</u> by 37 percent while the target school property loss <u>decreased</u> by 42 percent.

10. The control schools' value of property recovered increased by 27 percent whereas the target schools' declined 61 percent. Here, unlike the case of the target schools, the value of property recovered would likely increase since the value of property loss also increased.

11. The change in clearance rates for the target and control schools was identical, both increased by six percent over the two time periods.

12. The non-experimental socio-economic factors within the target and control schools changed at nearly constant rates over the two-year time periods; thus, lending support to the assumption that the changes in target and control school burglary frequency, property loss and property recovered are more likely due to the presence or absence of the anti-intrusion devices. (See Appendix C, and pp. 25-27)

13. Of the eight socio-economic factors correlated with burglary frequency and property loss, only the percentage of students attending school showed a significant association. The correlation (r) between percent attendance and burglary frequency was -.54; between percent attendance and property loss $r = -.60$. Both correlations are significant at $p<.001$. This finding supports the considerable previous evidence that alienation from school is highly associated with involvement in criminal behavior. (2) (3) (4) (5) (11).

PURPOSE OF THIS REPORT

The purpose of the Portland Public School's Burglary Prevention Project: Evaluation Report No. 1, Baseline Findings (Hereafter referred to as the Baseline Report) was to tabulate and depict the burglary information which would be used to compare with the data gathered after the installation of the anti-intrusion devices in eleven Portland Public Schools.

The purpose of this final report is to describe the project in some detail, discuss the methodology used to collect the post-installation data, the rationale behind the comparisons and statistical tests employed, and the implications these findings have on the current project and on the design and implementation of similar burglary prevention projects in the future.

This report is intended to reach a variety of audiences; i.e., the security or police chief interested in employing anti-intrusion technology to curb rising property crime rates, criminal justice planners interested in adding this information to his or her knowledge of similar projects for future funding decisions, and to researchers interested both in the findings of this project as well as the methodology and design of this study. Because of the diversity of backgrounds and interests these various groups bring with them, this report will be presented with enough detail and with enough attention to statistical methods to meet the requirements of the researcher and with enough explanation to be of value to the practitioner not as seasoned in research techniques.

The major focus of the burglary prevention project report is to measure the effect the installation of silent-alarm anti-intrusion devices has had on the burglary incidence, property loss, property recovery and clearance rates within a sample of eleven target schools. In addition to this main purpose, a cost-benefit analysis will be conducted which gives an indication of the rate at which reductions in the value of property stolen or damaged may accumulate to meet and surpass the accumulated implementation and maintenance costs of the system.

Although the major focus of this study concentrates on the effect of the centrally-monitored silent alarms on the incidence of burglary, a secondary analysis will be presented which will attempt to isolate the influence of certain demographic factors on burglary rates and their associated property loss.

PROJECT DESCRIPTION

The Portland Public Schools Pilot Program to Reduce Burglary-Related Property Losses was part of the Portland High Impact Program. The grant period extended from June 1, 1973 to May 30, 1976 and had as its goal the reduction of burglary-related property loss. Specifically, there was an expected 60 percent reduction in burglary losses over a three-year period. A significant reduction in the frequency of burglaries as well as an increase in apprehension was also expected.

The project was divided into three stages: a detailed planning and hardware systems design stage, an implementation stage, and a final debugging and operational stage. The first and second stages were completed in the target schools on February 1, 1975 so that burglary-related data gathered for a two-year period prior to this date is considered to be the pre-installation period while the two-year following February 1, 1975 constitutes the post-installation period. The grant application stipulates that a three-year pre- and three-year post-installation period would be used for comparison purposes; however, it was later decided that two-year pre-post intervals would provide sufficient time to determine both the immediate effectiveness of the alarm system as well as an indication of the long-term trend in burglary frequency and property losses.

In addition to the centrally-monitored intrusion detection equipment, local match funds were used to upgrade the door locks on all doors and to provide electrically operated strikes on key doors in each of the target schools.

II THE SAMPLE

The sample consists of twenty-two schools--eleven target and eleven control schools. The eleven target schools are those schools receiving the anti-intrusion sound and motion detectors and will be divided into two time frames: February 1, 1973 through January 31, 1975 will constitute the pre-installation period (T 1), and February 1, 1975 through January 31, 1977 will be the post-installation period (T 2). The eleven control schools will likewise be divided into two time frames, corresponding to those of T 1 and T 2 and will sometimes be referred to as C 1 and C 2. The control schools were not connected to the anti-intrusion alarm system and were protected only by existing independent visual or audible independent alarms. (See Appendix A for list of schools in each of the groups.)

METHODOLOGY

The economic necessity of preventing school break-ins and related property loss and damage in those schools with the greatest frequency of burglary made it impractical to conduct an equivalent experimental-control group study where the two groups would be chosen randomly. If such a design were carried out those schools needing the anti-intrusion devices the most would not necessarily be chosen as target schools. Because of this, the eleven schools experiencing the highest incidence of burglaries were chosen as the target schools. The eleven control schools were those schools that experienced the next highest frequency of burglaries amongst the population of all Portland Public Schools.

Figure 1 shows the location of each of the target and control schools. Examination of this figure reveals that for the most part the target and control schools are in rough proximity to one another, with the exception of Madison High School (a target school) which is fairly isolated from any control school and Hayhurst and Multnomah Elementary Schools (both control schools) which are isolated miles away from any target school. The majority of schools in both groups are clustered within the northeast section of the city at the junction of Administrative Areas 1, 2 and 3.

Two methods were used to determine the equivalence of the two groups of schools during the pre-installation time period. One procedure consisted of comparing the pre-installation criteria measures between the target and control schools using a t-test.[1]

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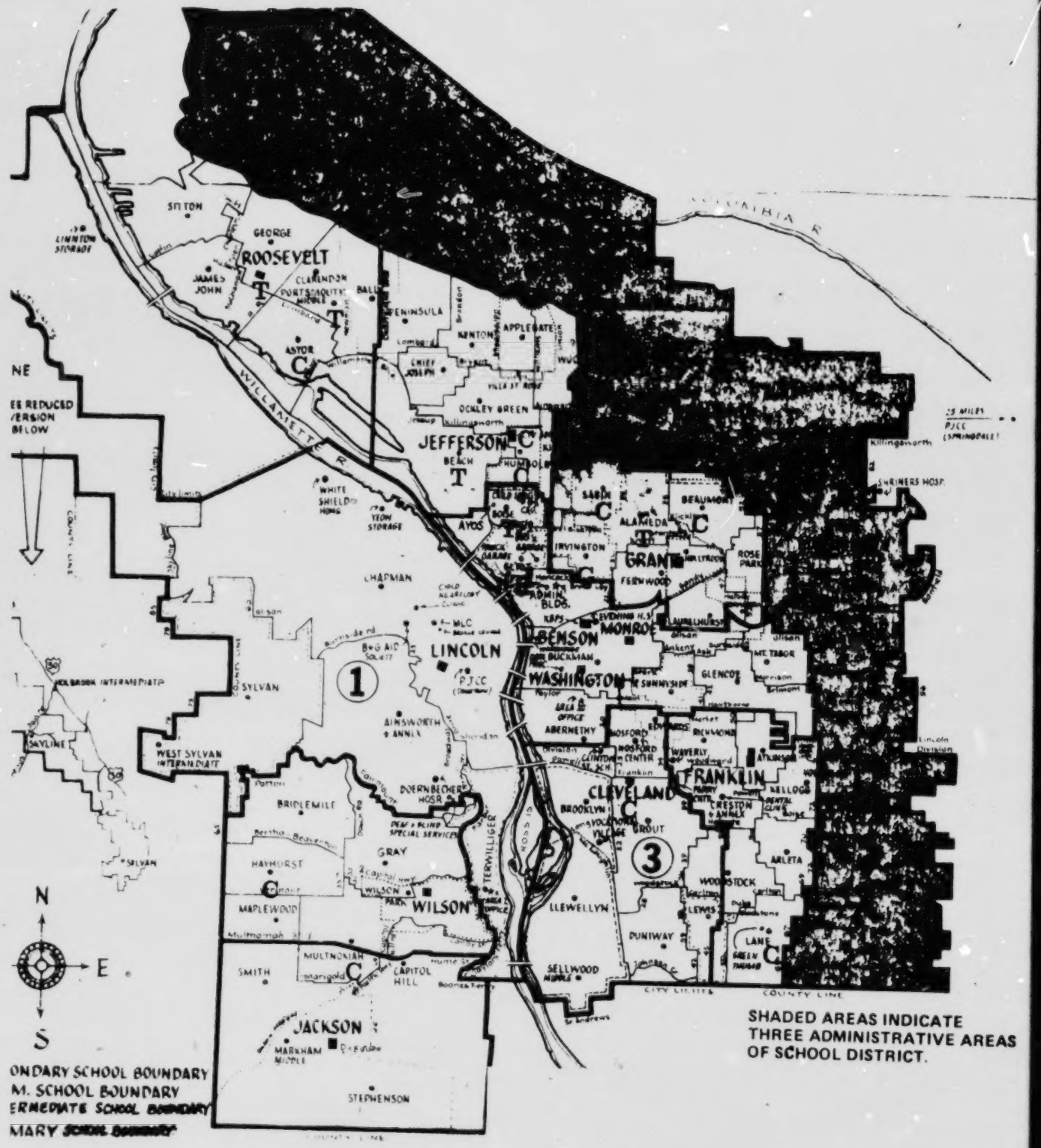
[1] Here an F-test was calculated first to determine the homogeniety of variance between the target and control measures. If F obtained was significant ($p < .05$), the statistic was calculated according to the formula given in Appendix E.



T Target School

C Control School

Figure 1

Location of Target and Control Schools

Table 1 shows how the target and control schools compared on the four criterion variables during the pre-installation period. Here the two groups of schools were tested for their similarity on the basis of the eight, three-month periods prior to installation. This was done rather than computing the significance of differences on the basis of each of the eleven schools in each group because it was found that the variance (range) in the values of the criterion variables was so great when each school was used as the unit of measurement that it greatly reduced the sensitivity of the t-test comparisons.[2]

TABLE 1

Comparison of Target and Control Schools on Pre-installation Criterion Measures by Quarter-year Interval

Criteria Variable	T1	C1	t** value	% Difference
Burglary Frequency Two year Total Mean	*n=8 135 16.9	n=8 84 10.5	2.83 <.02	-38%
Dollar Value Stolen/Damaged, two year Total Mean	N=8 $24,780 $ 3,097.50	N=8 $8,279 1,034.90	2.23 <.05	-73%
Dollar Value Recovered Two year Total Mean	N=8 $10,409 1,301.12	N=8 $ 773 96.62	*** 2.12 <.10	-92%
Clearance Rate Mean	.44	.12	2.82 <.02	-32%

*N=8 quarter year intervals
** All tests are 2-tailed with 8 + 8 -2=14 d.f.
*** Variances not homogenous, see Appendix E.

[2] Thus increasing the chance of a type II error, or falsely accepting the null hypothesis that there is no difference between the target and control schools.

In other words, instead of computing the variance on the basis of each of the target school's deviation from the average, the variance was computed on the basis of the burglary totals for all eleven schools over the eight quarter-year periods. This, consequently, reduced the "sample size" from eleven to eight but the decrease in variance resulting in this grouping showed that there are, in fact, statistically significant differences between the two groups.

Table 1 lists a significant difference between the target and control schools on pre-installation burglary frequency. Similarly, the second and fourth row of the table shows significant differences in the mean value of property stolen or damaged and in the clearance rates between the two groups of schools. The only criteria variable that did not reach significance at the $<.05$ level was the mean dollar value of property recovered.

Inspecting Table 1, it can be seen that although there was a 92 percent difference in the dollar value recovered, this difference translates into a low level of statistical significance ($<.10$) due to the extremely high variability in the quarterly totals within each sample. Although this does represent a statistically low level of significance, it can justifiably be said that a 92 percent difference is practically significant. All of these differences demonstrate a pattern of lower burglary rates, property stolen and recovered, and clearance rates in the control schools. This pattern is more than substantial enough to rule out the possibility of treating this study as an equivalent experimental-control group design. Consequently, the target and control schools will be treated as non-equivalent samples and no direct pre-post intervention tests will be made between them, so that the central test of program impact will be the within-group pre-post target school comparisons (T1-T2).

The second method used to compare the equivalence of the two samples at the onset of the project was to compare the target (T1) and control (C1) schools on the basis of several demographic characteristics. Here again, the same method of computing F-ratios and t-statistics was used as in the case of the criteria measures, except that the unit of measurement was each individual school's yearly average on each variable, rather than clustering the data into eight quarter-year intervals.

Appendix C describes in detail these demographic factors, their source and computation. Briefly, the demographic data for the pre-installation period, February, 1973 through January, 1975 is taken from 1971-72 or 1972-73 data gathered and tabulated in various school and census surveys and are listed by school in a Portland Public Schools document entitled Achievement Profiles, dated September, 1973. The demographic data for the post-installation period of February, 1975 through January, 1977 is taken from 1974-75 or 1975-76 school year data gathered from similar school and census surveys, and are listed in the Achievement Profiles dated June, 1976.

Table 2 lists the t-values for the comparison of these demographic variables between the target and control schools during the pre-installation period. On the basis of the t-values, only the percent of students coming from two-parent, husband-wife families emerges as significantly different between the target and control schools ($<.05$, two-tailed). Several other variables approach significance including the percent of students coming from welfare families, the percent of students receiving free lunches, the median education of their parents, and the percent of Caucasian students.

TABLE 2

Comparison of Target and Control Schools
on Pre-Installation Criterion Measures

Demographic Variable	Target School Means	Control School Means	t-value	Level of Significance*
Teacher Ratio	20.7	21.2	-.26	N.S
Percent mobility	14.1	13.7	.15	N.S
Percent Attendance	90.8	91.5	-.43	N.S
Percent on Welfare	35.5	21.0	1.27	N.S
Percent receiving free lunch	56.9	39.24	1.52	N.S
Percent two-parent family	77.27	83.9	-2.32	<.05
Parent's level of education (in years)	11.6	12.1	-1.63	N.S
Percent Caucasian	62.3	70.5	-.61	N.S
Median Income	$8,409	$9,727	-1.59	N.S

*Two-tailed test, d.f.=20

The most striking difference between the target and control schools on these pre-installation variables is that the target schools showed a lower percentage of children coming from intact families. Besides this, there is a tendency, though not significant with this small sample (N1 + N2 =22), for the higher crime incidence target schools to draw from communities populated by relatively lower income, less stable families; whereas the control schools draw from communities where the student's parents are relatively better educated, receive higher incomes and are less likely to be separated or divorced. This relationship is only tentative and certainly does not prove any causative relationship between these factors and the rate of burglary, but it does show a pattern of demographic association with burglary rates. The actual correlation between each of these factors and burglary frequency and property loss will be discussed in Appendix D.

IV FINDINGS

A. Within Group Pre-Post Installation Comparison of Target Schools.

Table 3 lists the pre- and post-installation values for the four criterion (project objective) variables. The first row of this table shows there was a 27 percent reduction in burglary rates between the two-year baseline (pre-installation) and two-year post-installation periods with the incidence of burglaries in the target schools dropping from 135 during the pre-installation to 99 during the post installation period. This decrease is significant at $<.05$, one-tailed.*

TABLE 3

Comparison of Pre-Post Alarm Installation Measures in Target Schools by Quarter-Year Intervals

Criterion Variable	Time Period T1	T2	t** Value	% Change
Burglary	*N=8	N=8		
Frequency Two-Year Total	135	99	2.14	-27%
Mean (Qrtr)	16.9	12.4	<.05	
Dollar Value Stolen/Damaged Two-Year Total	$24,780	$14,287	*** 1.37	-42%
Mean (Qrtr)	$3,097.50	1,785.87	N.S.	
Dollar Value recovered Two-Year Total	10,409	4,162	3.69	-61%
Mean (Qrtr)	1,301	520.25	<.005	
Clearance Rate (Qrtr)	.44	.50	-.41 N.S.	+6%

*N=8 quarter-year intervals
**All tests are one-tailed with 8-1=7d.f.
*** Variances not homogenous. See Appendix E.
N.S. Not statistically significant

Although there was a notable 42 percent decrease in the value of the property stolen or damaged in the commission of burglaries during the post-installation period, this drop did not reach statistical significance. But here, as in the comparison of the T'-C1 measures, there can be clear differences in the absolute values, but no differences statistically because: (1) the t-statistic employed here, where the variances between groups are heterogeneous, is a conservative measure of the difference between means, (2) n is small (target n=8, control n=8), and (3) the within group variance is large. These conditions give contradictory practical v. statistical differences.

Row three of Table 3 shows a reduction of 61 percent in the dollar value of property recovered during the post-installation period. The mean value per school dropped $568. This may be a result of the fact that policemen were alerted to burglaries sooner after the silent alarms were installed and arrived on the scene sooner. Consequently, the property involved in the burglary was not as likely to be removed from the building and counted as stolen and recovered. This drop did prove to be significant.

The last row of Table 3 illustrates a six percent increase in the clearance rate for the post-installation target schools. The 50 percent post-installation clearance rate compares with a 16.7 percent clearance rate for all burglaries in the state (6:29). The pre-post increase is not statistically significant.

B. Within - Group, Pre-Post-Installation Comparison of Control Schools.

Table 4 summarizes the totals, means, percentage change and t-values on the four criterion measures for the control schools during the pre- and post-installation phases. Again, the same t-statistics were employed as in the case of the target school comparisons (see Appendix E).

None of the differences in the criteria factors changed significantly over the four-year period. The frequency of burglaries declined eleven percent in the control schools while the value of property loss increased 37 percent. The dollar value of recovered property increased by 27 percent and the clearance rate increased by six percent.

TABLE 4

Comparison of Pre-Post Alarm Installation Criterion
Measures in Control Schools
By Quarter-Year Intervals

Criterian Variable	Time Period C1	C2	** t value C1-C2	% Change
Burglary Frequency	*N=8	N=8		
Two-Year Total	84	75	1.38	-11%
Mean (Qrtr)	10.5	9.37	N.S.	
Dollar value Stolen/Damaged				
Two-Year Total	$8,279	***$11,399	-1.37	+37%
Mean (Qrtr)	$1,034.87	$1,424.87	N.S.	
Dollar value Recovered				
Two-Year Total	$773	$983	-.07	+27%
Mean (Qrtr)	$96.62	$122.87	N.S.	
Clearance Rate			-1.35	
Mean (Qrtr)	.12	.18	N.S.	+6%

*N=8 quarter-year intervals
** All tests are two-tailed with 8-1=7 d.f.
*** Does not include $714 stolen during unknown month.
N.S. = Not Statistically Significant

The fact that none of these differences proved to be statistically significant lends support to the assumption that there were no confounding conditions which entered into the control schools during this quasi-experimental program. Thus, any significant changes in the target schools are more likely due to the installation of the alarms. Although there was only one significant change in the pre-post installation target school criterion variables (burglary frequency) the direction and magnitude of the differences in conjunction with the direction and magnitude of the differences in the pre-post control measures manifests several indications of probable project success.

C. Projected Trends in Target and Control School Burglaries and Net Losses.

1. Target and Control Schools-Burglary Frequency

Figure 2 is a plot of the actual burglary frequency for all target schools during the pre-installation period. These points on the graph are for quarter-year intervals and extend to the dashed vertical line in the middle of the graph. The dashed line represents that point in time when the alarm system was made operational in the target schools. The dashed sloping line extending from that point on is a least-squares projection of burglary frequency based upon the pre-installation frequency. In other words, it is an estimation of the trend that would have occurred in the burglary rates in the target schools if no anti-intrusion devices had been installed. As can be seen, had this trend continued unchecked, the burglary frequency in the target schools would have risen to a projected 30.1 burglaries per quarter by January, 1977.

Figure 3 is a continuation of Figure 2 in that it is a graph of the actual burglary frequency in the target schools after the installation of the alarms. There is a clearly discernible decline in the incidence of burglary frequency over the post-installation period. The least-squares projection in

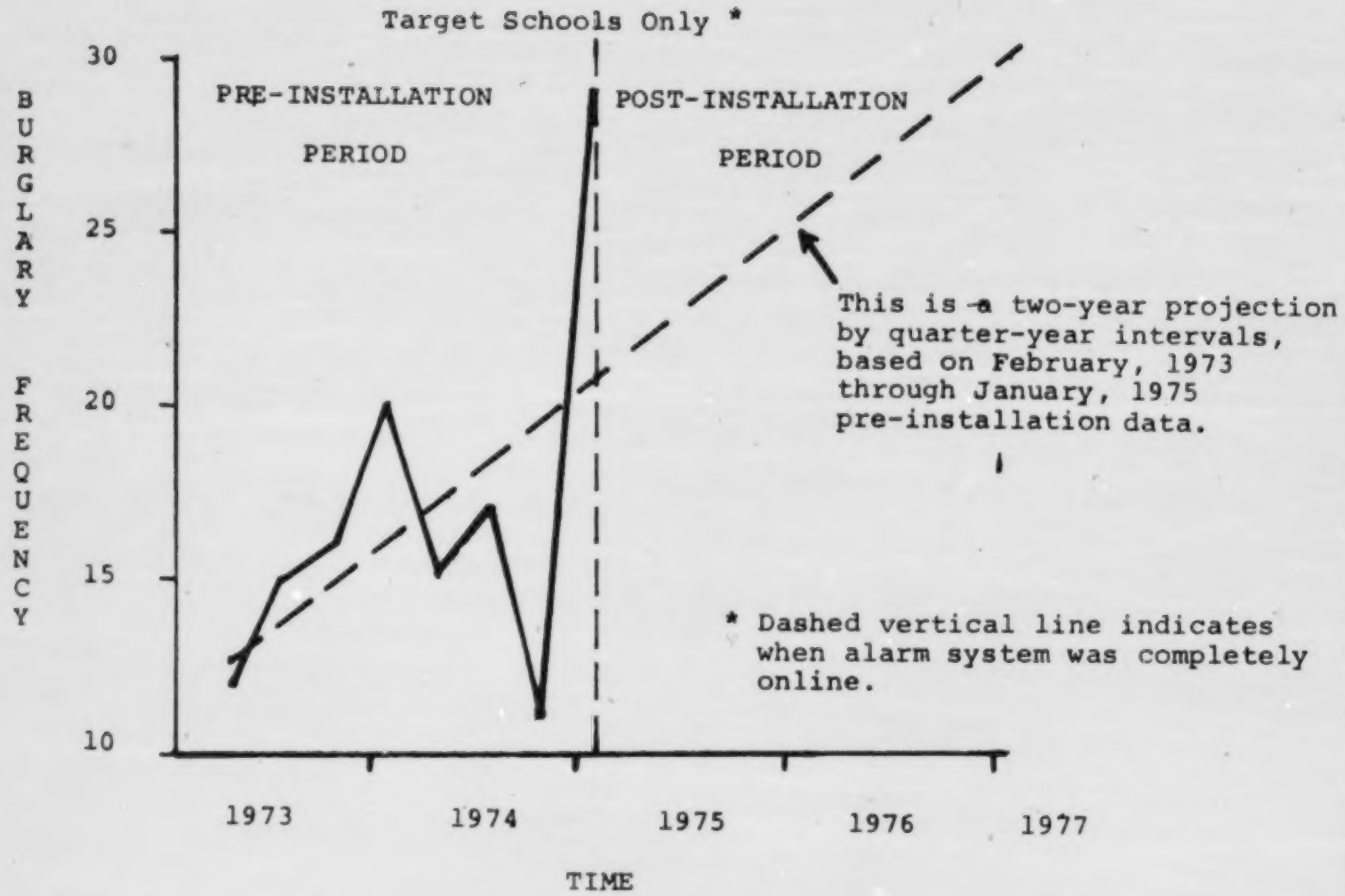


Figure 2

Burglary Frequency Projection--Post-Installation Burglary Frequency in Target Schools Based on Pre-Installation Frequency

Figure 3 is based on a logarithmic projection of the actual post-installation values, thus obtaining a smoothed curve to more accurately depict the burglary rate projection through January, 1979. This projection, as is the case in all projections in this report, is limited to a two-year trend line forecast, since the projection is based only on a two-year period of time. Any further extension of the projection would be less reliable.

Figure 4 is a composite of Figures 2 and 3 and illustrates the dramatic drop in burglaries coinciding with the installation of the anti-intrusion detectors.

The accumulated divergence between the projection of burglary frequency based upon pre-installation figures and the actual post-installation figures is summarized in Table 5. This Table tabulates the data in Figure 4 and shows that at the end of 1976 approximately 208 burglaries were projected to have occurred if action had not been taken to check the rising burglary rate in the target schools. Of course, there is no certain way of testing this conclusion in the absence of a matched or randomly equivalent control sample. If one were available its projected v. actual burglary frequencies could be compared with the projected v. actual burglary frequency in the target schools. With this limitation in mind, it can further be seen from Table 5 that the 208 projected burglaries are a greater number (109) than the actual post installation total of 99 burglaries. Again, whether or not such a discrepancy would have occurred in the absence of the alarm installation is uncertain. The only other clue as to the trend which might have occurred in the target schools had the alarm not been installed is for an analysis of the projected v. actual burglary frequency in the control schools during this same time period, keeping in mind the differences as well as the similarities of the two groups.

It can be seen by comparing Tables 5 and 6 that while there was a pronounced difference in the projected versus actual frequency for the target schools (52% total difference) there was relatively little change in the pro-

Target Schools Only

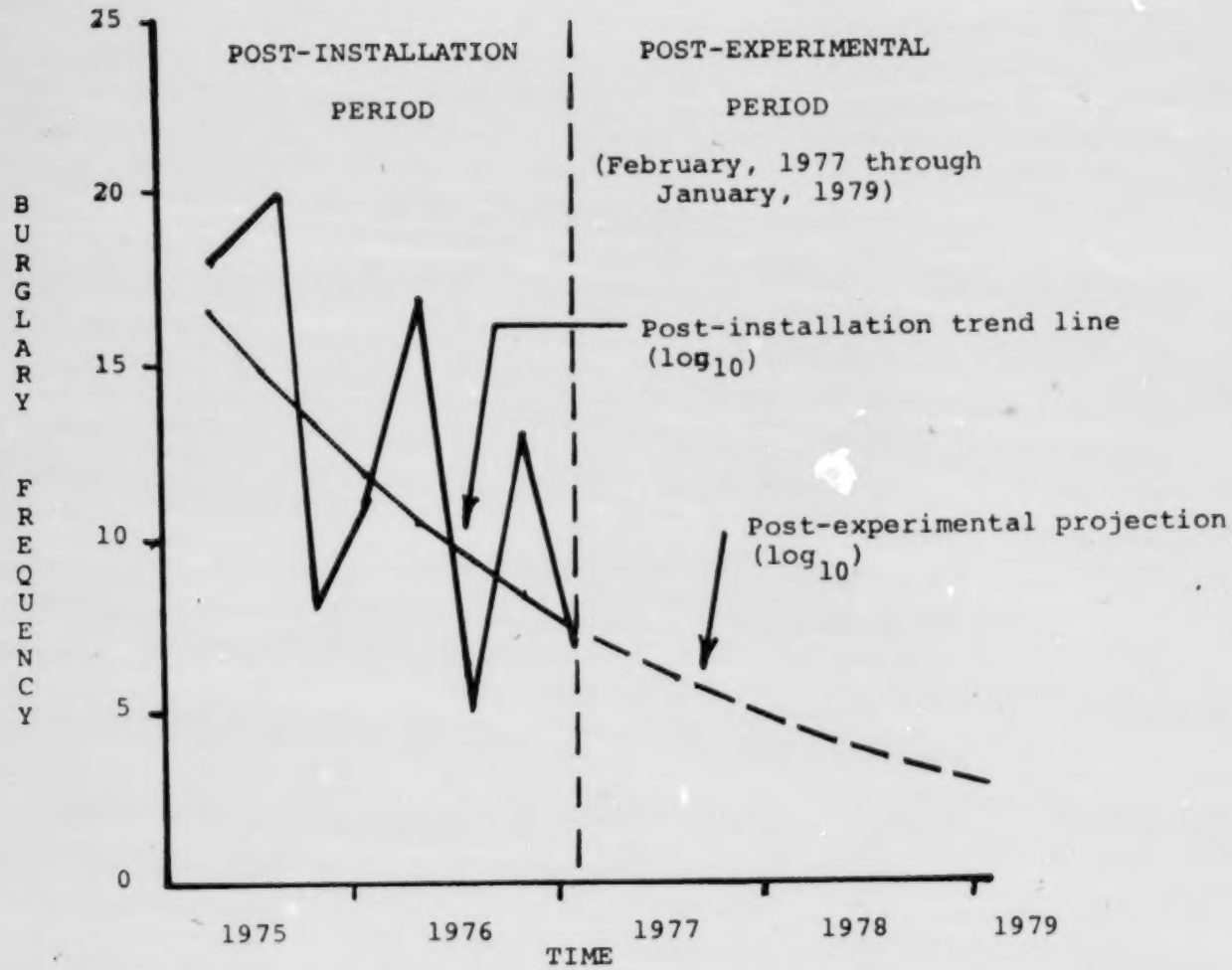


Figure 3

Burglary Frequency Projection--Two-year Post-Experimental Projection Based on Actual Post-Installation Burglary Frequency in Target Schools

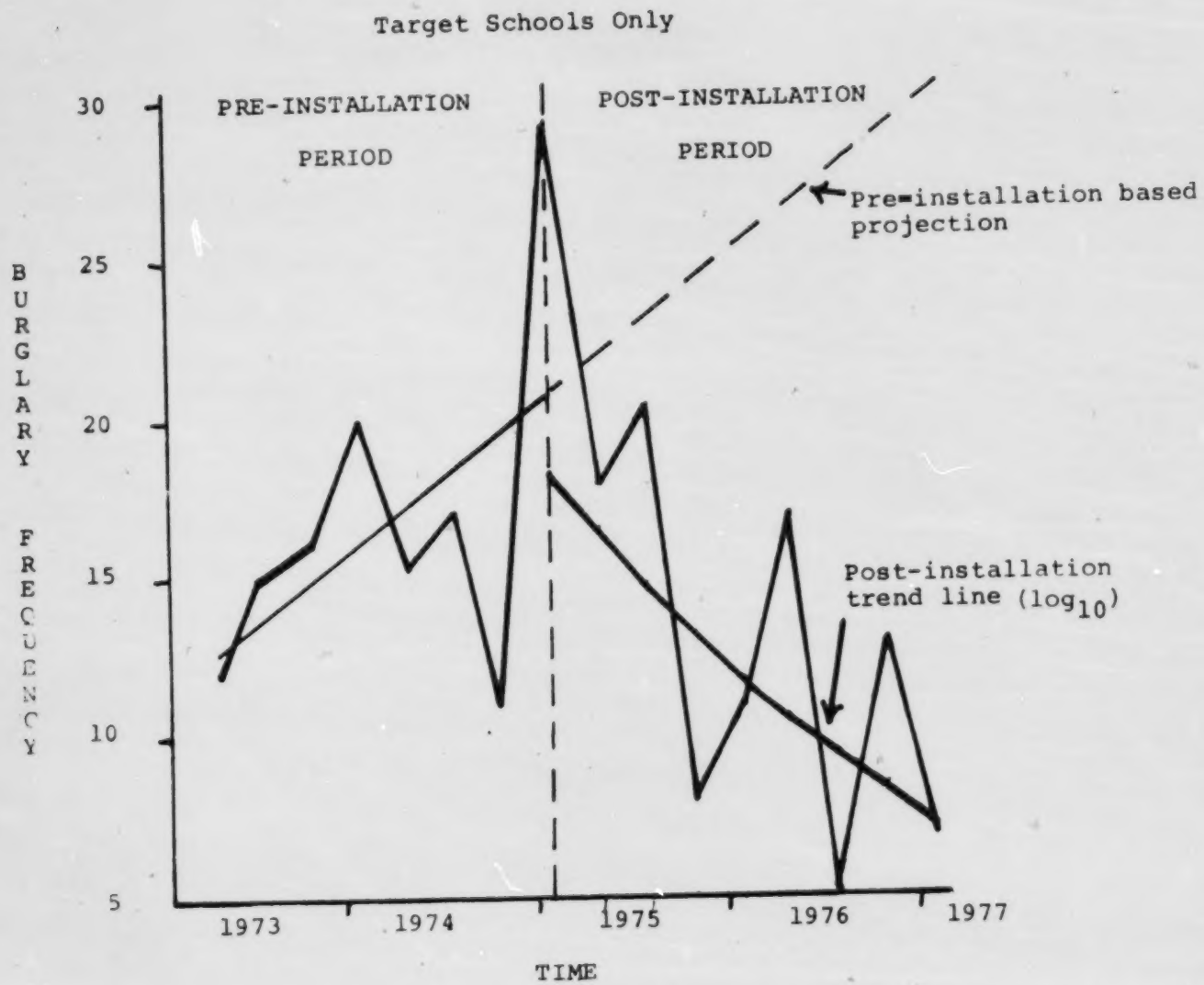


Figure 4

Burglary Frequency Projection--Actual and Projected Burglary Frequency Based on Pre and Post-Installation Burglary Frequency in Target Schools

TABLE 5

Comparison of Pre-installation Projections of Burglary Frequency
and Actual Post-Installation Burglary Frequency
In Target Schools by Quarter-Year Interval

Quarter Year	Post-Installation ***Projection	Actual Post-Installation Frequency	Difference	%
*1975-1st Quarter	22	18	-4	-18%
1975-2nd Quarter	23	20	-3	-13%
1975-3rd Quarter	24	8	-16	-67%
1975-4th Quarter	25	11	-14	-56%
1976-1st Quarter	27	17	-10	-37%
1976-2nd Quarter	28	5	-23	-82%
1976-3rd Quarter	29	13	-16	-55%
**1976-4th Quarter	30	7	-23	-77%
TOTAL	208	99	-109	-52%

* Excludes January, 1975
** Includes January, 1977
*** Based on Pre-Installation Frequency Rounded to nearest whole number.

TABLE 6

Comparison of Pre-Installation Projections of Burglary Frequency and Actual Post-Installation Burglary Frequency in Control Schools, by Quarter-Year

Quarter Year	Post-Installation *** Projection	Actual Post-Installation Frequency	Difference	%
*1975-1st Quarter	10.5	13	+2.5	+24%
1975-2nd Quarter	10.5	15	+4.5	+43%
1975-3rd Quarter	10.5	4	-6.5	-62%
1975-4th Quarter	10.5	5	-5.5	-52%
1976-1st Quarter	10.5	10	-.5	-5%
1976-2nd Quarter	10.5	10	-.5	-5%
1976-3rd Quarter	10.5	9	-1.5	-14%
** 1976-4th Quarter	10.5	8	-2.5	-24%
TOTAL	84	74	-10	-12%

*Excludes January, 1975
** Includes January, 1977
***Based on Pre-Installation Frequency

jected vs. actual frequency in the control sample (12% total difference).

A chi-square test performed on the projected and actual burglary frequency in the target schools yielded a significant value (X^2=16.08, d.f.=7). Another chi-square test performed on the projected and actual burglary frequency in the control schools yielded an insignificant value (X^2=5.79, d.f.=7). What these test results show is that while there was a significant difference between the pre-installation-based projection and the actual post-installation burglary rates (what was expected to happen if no alarms were installed v. what actually happened) in the target schools, there was an insignificant difference in the pre-installation-based projection and the actual post-installation burglary rates for the control schools. This was expected, since the target schools were hypothesized to be burglarized less often as a result of the installation of the alarms, while there was little, if any, expected change to take place in the burglary rate in the control schools over the two time periods.

Figure 5 provides a graphic representation of the actual pre-installation burglary frequency, its associated trend line, and the actual post-installation burglary frequency and its associated trend line in the control schools. Examination of Figure 5 shows a close resemblence between the pre-installation based projection line and the post-installation actual rate of burglary (as summarized in Table 6). Comparison of Figures 4 and 5 reveals, as do Tables 5 and 6, the stability of burglaries in the control schools and the abrupt drop in burglaries in the target schools between the two time periods.

Since the two samples are not strictly equivalent, no direct comparison can be made; however, given the strength of the drop in burglary rates from the expected projection in the target schools and the relatively consistent burglary trend in the control schools, there is justification for stating that the introduction of the alarms had the hoped for effect on burglary rates. Of course, this conclusion is based on the assumption that there was nothing else besides

Control Schools Only

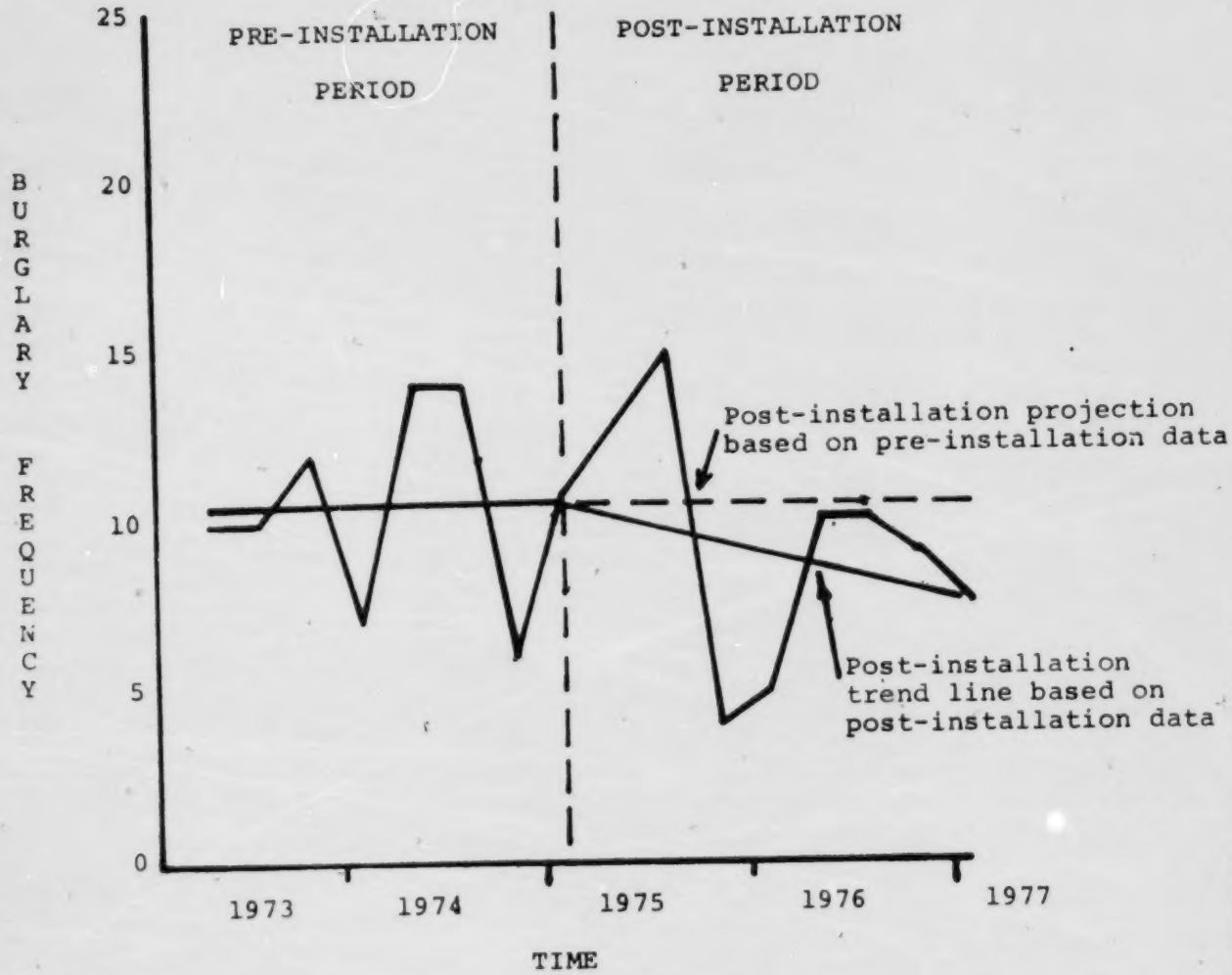


Figure 5

Burglary Frequency Projection--Actual and Projected Burglary Frequency Based on Pre and Post-Installation Burglary Frequency in Control Schools

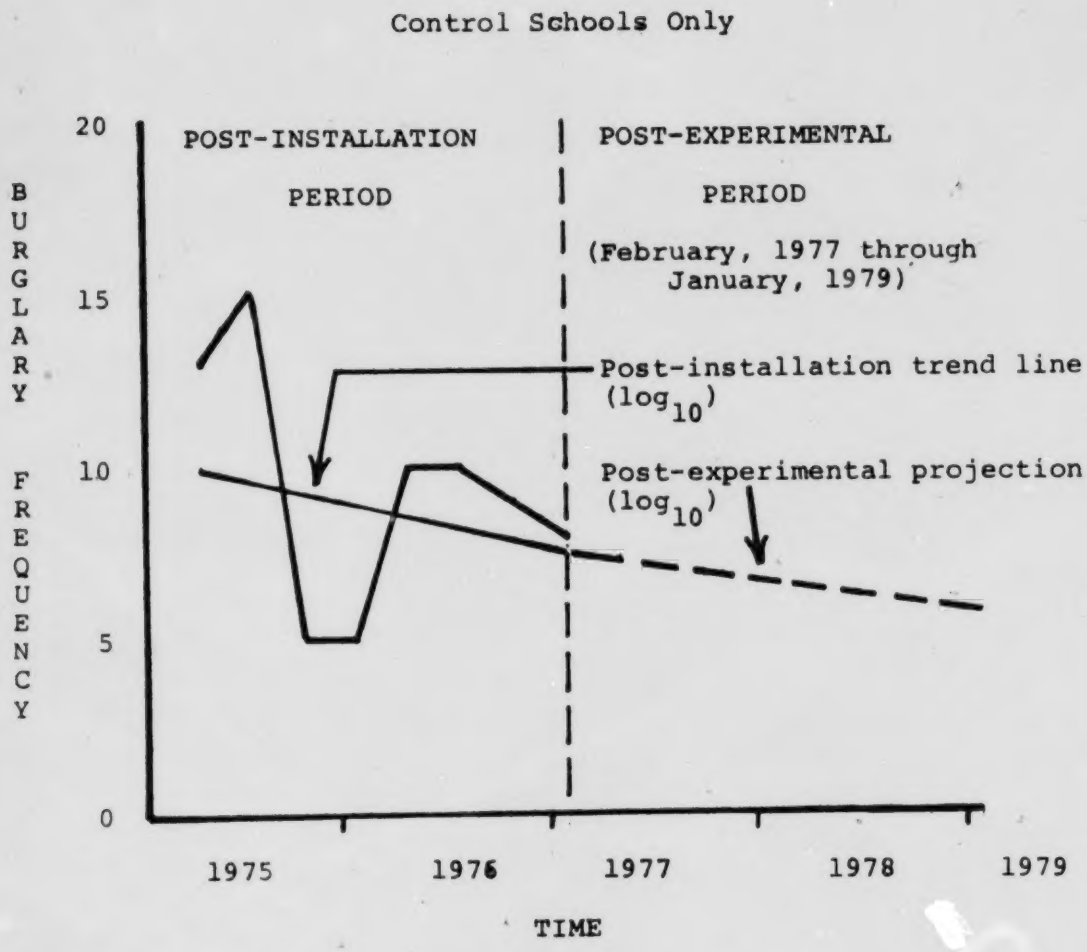


Figure 6

Burglary Frequency Projection--Two-year Post-Experimental Projection Based on Actual Post-Installation Burglary Frequency in Control Scools

the installation of the alarm system which had a significant impact on burglary rates in either of the samples. This, with the exception of the comparison to follow, can only be assumed given the experimental limitations of this project.

One way to determine if there were any other extraneous factors which changed during the pre- and post-periods which may have had a confounding effect upon the burglary criteria variables is to inspect the differences in the associated demographic characteristics of each group to determine any significant shifts in the social environment. Here, the same demographic variables discussed in Section III will be compared; first, between the pre- and post-installation periods for the target schools, and then the same will be done for the control schools.

Table 7 lists the nine demographic variables and their corresponding pre- and post-installation measures and t-values for the target schools. A significant rise in student mobility, a significant drop in the percent of children from two-parent families, and a significant rise in the level of parental education and family income was encountered over the two, two-year periods.

Table 8 lists the same information for the control schools. Looking at both of these tables, it seems that with the exception of a significant increase in free lunches, the control schools manifested significant changes in the same variables and in the same direction as in the target schools. Although these factors only represent a few (and not necessarily the most important) demographic variables that could have been considered, these results lend at least a consistant indication that despite differences in the absolute values between the target and control schools, they have experienced similar changes in certain socio-economic indices over the total four-year comparison period. Taking this relative environmental constancy into consideration, any changes in the burglary rates and their associated property losses can be attributed to the presence or absence of the anti-intrusion devices with a greater degree of certainty than

TABLE 7

Comparison of Pre and Post-Installation Demographic Variables in the Target Schools

Demographic Variable	Time Period T1	T2	t-value	*Significance
Student/Teacher ratio	20.7	20.2	.64	N.S.
%Student mobility	14.1	23.8	-2.52	<.05
%Student attendance	90.8	89.9	1.64	N.S.
% Welfare families	35.5	35.0	.06	N.S.
% Receiving free lunch	56.9	65.7	.84	N.S.
% Two-parent families	77.3	75.5	4.90	<.001
Parent's level of education (In Years)	11.6	11.8	-3.97	<.01
Median Family Income	$8,409	$11,672	-15.91	<.001
% Caucasian	62.3	61.7	.52	N.S.

*t for dependent and correlated samples where d.f.=N-1=10. All tests are two-tailed.

TABLE 8

Comparison of Pre and Post-Installation Demographic Variables in the Control Schools

Demographic Variable	Time Period C1	C2	t-value	*Significance
Student/Teacher ratio	21.2	20.6	.98	N.S.
% Student Mobility	13.7	20.5	-3.12	<.01
% Student Attendance	91.4	92.1	-.91	N.S.
% Welfare Families	20.9	20.4	.08	N.S.
% Receiving free lunch	39.2	58.5	-4.67	<.001
% Two parent families	83.8	80.9	4.54	< .01
Parents level of education (Median in years)	12.1	12.3	-14.8	<.001
Median family income	$9,727	$13,418	-14.3	<.001
% Caucasian	70.5	70.6	-.02	N.S.

*t for dependent and correlated samples where d.f.=N-1=10 And all tests are two-tailed.

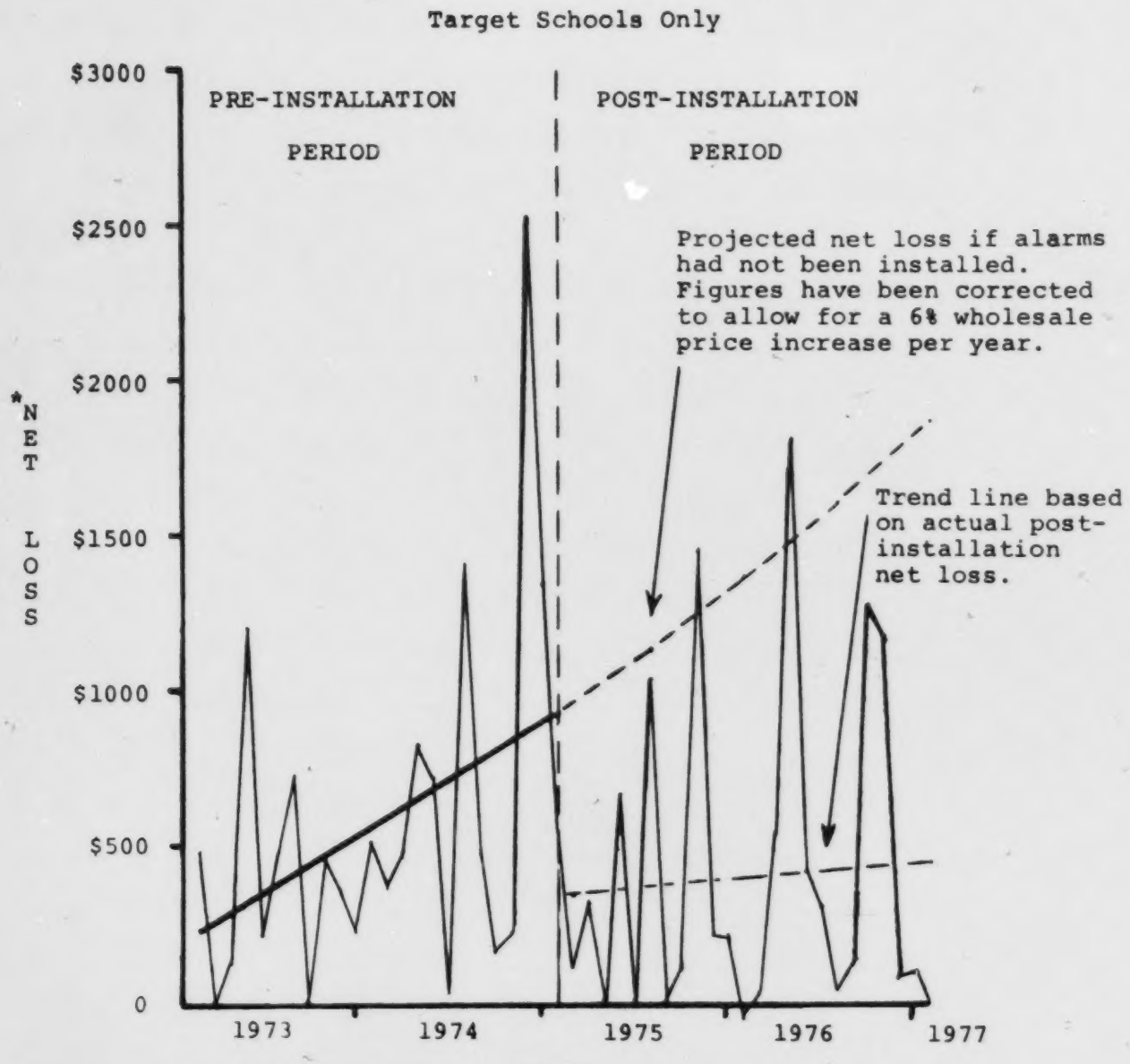
if there was wide divergence in these demographic variables.

Mention should be made here that based on the projection of post-installation burglaries in the target and control schools, the projections of the subsequent burglaries for the two-year period ending February 1, 1979 predicts that the target schools will experience approximately 44 burglaries during this time period, while the control schools can expect approximately 52 burglaries if the post-installation trends in both groups continue. (See Figures 3 and 6). However, this should be qualified with the fact that due to the fluctuations in the number of burglaries over the two-year base period (see graphs, Figures 3 and 6) neither of the correlation coefficents for either projection proves to be significant at the .05 level of confidence (r target=-.61, r control=-.38, n=8, d.f.=6).

2. Target and Control Schools-Net Property Loss

Figure 7 is a graph which plots the actual net loss[3] in the target schools by month for the pre- and post-installation periods. The solid projection line extending from the lower left corner of the graph to the upper right corner is the expected net loss line based upon pre-installation losses. The dashed line extending through the points on the post-installation side of the graph is the trend line based on the actual post-installation net losses. This graph depicts the discrepancy between the projected v. actual net losses, in much the same way that Figure 4 illustrated the difference between projected v. actual burglary frequency in the target schools. A t-test was performed on the means of the net losses by quarter-year intervals over the post-installation period from the projected and actual trend lines. This was done to measure the degree of significance of difference between the expected v. actual net loss. The result was significant ($t=6.7$, d.f.=14, $<.0005$, one-tailed), thus showing that the

[3]Net loss is the total value of property stolen and/or damaged in burglaries minus the value of property recovered.



*Net Loss is total property loss minus amount of property recovered.

Figure 7

Net Loss Projection--Net Loss Projection in Target Schools Based on Actual Pre-Installation Net Loss and Actual Post-Installation Net Loss by Month

probability of a difference of this magnitude being due solely to chance is extremely remote (less than 5 in 10,000).

Unfortunately, the trend in the net loss in the control schools did not permit a similar sort of analysis as was done with the target schools.

Figure 8 illustrates that a post-installation projection of net losses based upon pre-installation net losses is not possible with linear projection since the trend line in net losses reaches the $0 loss base line prior to the post-installation period.

However, casual observation of Figure 8 reveals a noticeable rise in property loss coinciding with the post-installation period, after tapering off to a relatively low level at the end of the pre-installation period. This would indicate to some, in light of the notable decrease in net loss in the target schools during the post-installation period, that a displacement effect was operating. This is to say that there may have been a shift in burglary losses to the relatively unprotected control schools once the alarms were installed in the target schools. However, this phenomenon is unlikely in view of the fact that the burglary frequency did not rise in the control schools during the post-installation period. So, what remains is the fact that although the burglary frequency did not increase during the post-installation period, the net loss increased per burglary in the control schools.

Tables 9 and 10 summarize the net losses for the target and control schools, respectively. As can be seen from the bottom line of these tables, while there was a 39% <u>increase</u> in the net losses in the control schools, there was a 30% <u>decline</u> in the net losses in the target schools. Neither of these appreciable changes proved to be significant because the number of observations is small (8) and there is wide variability between quarterly time periods. A comparison of pre-post measures between the net loss of the target and control schools was

Control Schools Only

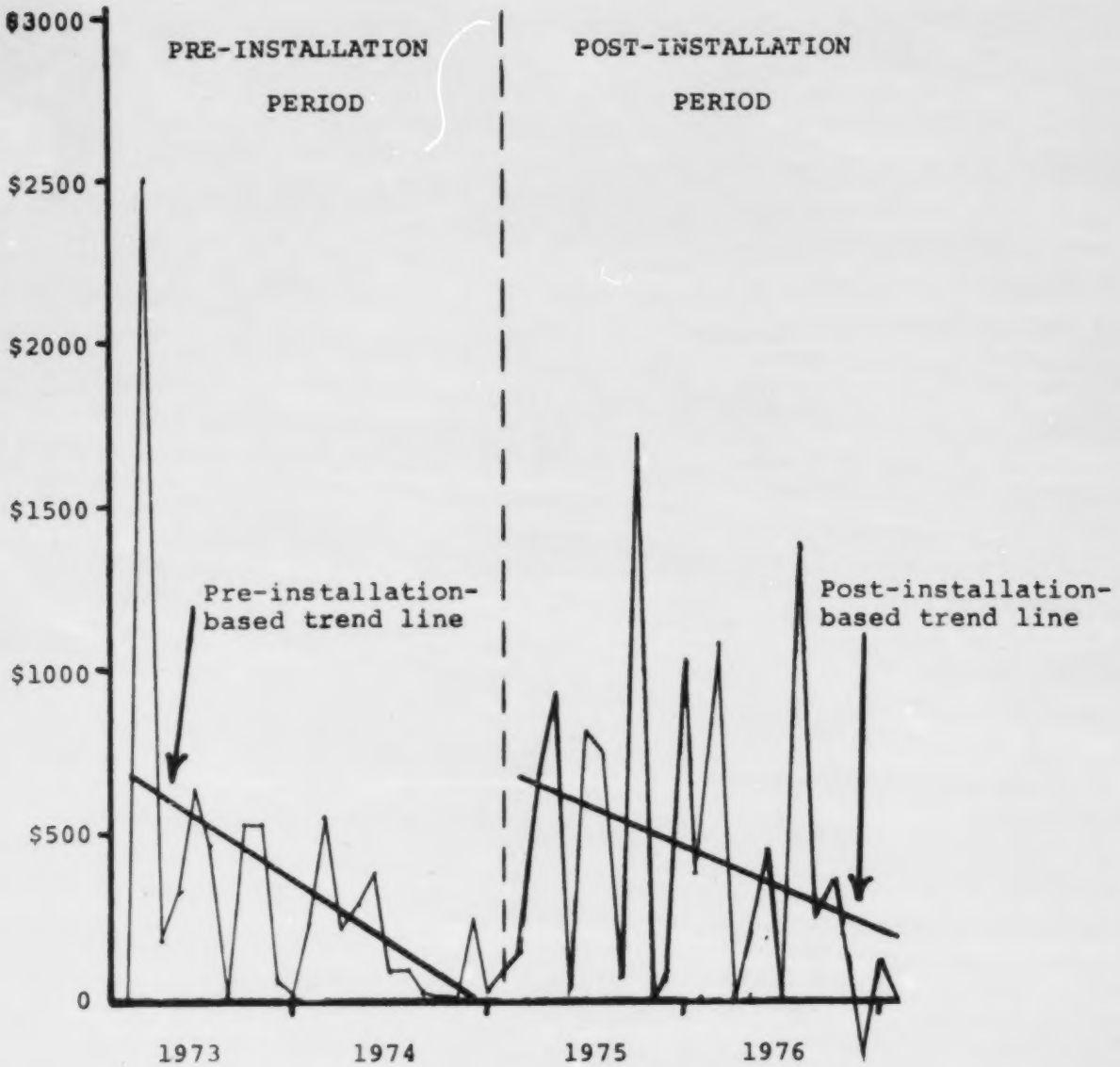


Figure 8

Net Loss Trend--Net Loss Trend in Control Schools Based on Actual Pre-Installation Net Loss and Actual Post-Installation Net Loss by Month

TABLE 9

Comparison of Actual Pre and Post-Installation Net Loss in Target Schools by Quarter-Year Interval

Time	1973-75 Pre Installation	1975-77 Post Installation	Change	% Change
1st Quarter	$ 618	$ 462	-$156	-25%
2nd Quarter	1,930	1,719	-$211	-11%
3rd Quarter	1,588	1,574	-$14	-01%
4th Quarter	1,101	385	-$716	-65%
5th Quarter	1,684	573	-$1,111	-66%
6th Quarter	2,167	2,523	+356	+14%
7th Quarter	842	1,477	+635	+43%
8th Quarter	4,441	1,412	-3,029	-68%
TOTAL	$14,371	$10,125	$4,246	*-30%

Pre-Installation Mean=$1,796
S.D. = $1,194
Post-Installation
Mean $1,265
S.D. = $ 741

*t= 1.30-Not significant, where d.f.=7, one-tailed.

TABLE 10

Comparison of Actual Pre and Post-Installation Net Loss in Control Schools by Quarter-Year Interval

Time	1973-75 Pre Installation	1975-77 * Post Installation	Change	% Change
1st Quarter	$ 2,689	$ 1,767	-922	-34%
2nd Quarter	1,440	1,600	+160	+11%
3rd Quarter	1,095	1,773	+678	+62%
4th Quarter	2,971	1,478	-1,493	-50%
5th Quarter	1,061	1,286	+225	-21%
6th Quarter	551	1,840	+1,289	+234%
7th Quarter	22	769	+747	3,495%
8th Quarter	351	-97	-448	-128%
TOTAL	$ 7,506	$10,416	+2,910	* +39%

*Does not include $714 stolen during unknown month.

Pre-Installation Mean =	$1,272
S. D. =	1,064
Post-Installation Mean=	1,302
S. D. =	664
t =	-.09

Not statistically significant where d.f.=7, two-tailed.

not made because of the previously discussed limitations imposed by the non-equivalence of the two groups of schools.

D. Cost Effectiveness

The cost effectiveness component of the evaluation will consist of two elements. The first will be a computation of the total installation costs and maintenance costs for the current evaluation period, that is, from the date of project initiation until the end of the post-installation period, February, 1977. The costs of the alarm system will be compared with any resulting increases or decreases in the value of property recovered, stolen or damaged. Here, a net benefit value will be obtained by simply totaling and comparing the gross costs and benefits of the project. The second element of the cost-benefit analysis will be an attempt to estimate the cost-benefit of the project on the basis of future projected costs based upon project personnel estimates of anticipated maintenance costs and projected benefits in terms of reduced value of property stolen and damaged based upon a time-series analysis of past and current trend data.

The implementation costs of the Portland Public Schools Pilot Program to Reduce Burglary Related Property Losses are listed below in Table 11.

TABLE 11

Implementation Costs

BUDGET * CATEGORY	ACTUAL EXPENDITURES
Personnel	$ 58,357.83
Fringe Benefits	7,951.22
Travel	62.59
Supplies	7,682.45
Contractural	205,649.23
TOTAL	$ 279,703.32

*This cost breakdown excludes indirect charges and non-alarm equipment.

To the implementation costs in Table 11 must be added the on-going system costs incurred for electronics personnel and the contracted maintenance costs for the eight-month period following the termination of federal funding, up to the end of the post-installation comparison period. This time period extends from June 1, 1976, through January 31, 1977.

School District Electronics Personnel	$ 3,970.68
Contracted Maintenance Services	8,400.00
	$12,370.68

These costs bring the total cost of the anti-burglary system to $292,074. To this must be subtracted the post-installation decrease of $4,246 in net property loss in the target schools. When this savings figure is subtracted from the $292,074 total system costs through January, 1977 the costs exceed the savings benefits by $287,828.

Although this represents a large deficit in terms of the ability of the system to "pay for itself" by decreasing the value of property stolen, several important considerations should be mentioned here. One such consideration is that this decrease represents only a two-year savings in net losses and is based upon the differences in net loss totals between the two comparison periods without taking into consideration the projected net losses based on the pre-installation net loss. Since there was a strong increase in losses within the pre-installation period, and if this trend had continued, the resulting difference between actual v. projected savings will substantially increase the annual savings of the system. (See Figure 7). Tables 9 and 12 describe this difference more closely. The $4,246 figure comes from the column marked "change" in Table 9 and is the basis of the above analysis. The same column of Table 12 shows an actual v. projected net loss differential of $21,389.

TABLE 12

Comparison of Actual and Projected Net Loss
In Target Schools by Quarter-Year Interval

Time Interval	Actual Post-Installation Net Loss	*Projected Post-Installation Net Loss	Change	% Change
1st Quarter	$ 462	$ 3,008	+2,546	+551%
2nd Quarter	1,719	3,250	+1,531	+189%
3rd Quarter	1,574	3,527	+1,953	+224%
4th Quarter	385	3,799	+3,414	+987%
5th Quarter	573	4,073	+3,500	+711%
6th Quarter	2,523	[illegible],346	+1,823	+172%
7th Quarter	1,477	4,618	+3,141	+313%
8th Quarter	1,412	4,893	+3,481	+347%
TOTAL	$10,125	$31,514	21,389	+211%

*Figures have been adjusted for a six percent annual wholesale price increase per year; and are based upon pre-installation net loss.

If actual pre v. post savings in net losses are used, a 30% reduction over the two-year post-installation period is realized. However, if the comparison is made between actual post-installation losses and projected post-installation losses, which are based on the pre-installation trend, there is potentially a $21,389 loss averted because of the alarm system. Based on this two-year projection of $21,389 (or $10,694 per year) another cost-benefit comparison was made. Here the trend line is extended through to the end of January, 1977 and the projected loss line is held constant from that point until the end of January, 1987. Table 13 summarizes this projection between the costs of the system and the estimated averted losses due to the system over a ten-year period.

TABLE 13

Projected Costs and Savings in
Net Loss over Ten-Year Period

Date	Implementation and Projected Maintenance Costs	Projected Savings in ** Net Losses
Thru January, 1977	$292,074*	$ 10,694****
Thru January, 1978	10,422***	11,335
Thru January, 1979	11,047	12,015
Thru January, 1980	11,710	12,736
Thru January, 1981	12,413	13,500
Thru January, 1982	13,157	14,310
Thru January, 1983	13,946	15,169
Thru January, 1984	14,783	16,079
Thru January, 1985	15,670	17,044
Thru January, 1986	16,610	18,067
Thur January, 1987	17,607	19,151
TOTAL	$429,439	$170,795

*Includes federal and local funds for project personnel, fringe benefits, travel, supplies, contractual fees, plus maintenance costs over and above those allocated in the grant.

**Projected savings due to alarm installation as determined by the difference between actual post-installation losses v. pre-installation-based projected post-installation losses.

***Continuing post-grant maintenance costs based on projected electronics personnel wages (6% increase per year).

****Projected savings are projected to increase at a rate of 6% per year due to increases in wholesale prices.

Subtracting the accumulated savings in net loss from the initial and accumulated maintenance costs of the system, the costs exceed the potential savings by $258,644.

Several qualifications of this result are in order. First, this again represents an estimate of costs and averted losses and; therefore, may not reflect actual future cost-benefit outcomes. The linear projection of net loss based on pre-installation data yields a statistically unreliable correlation coefficient of $r=.58$ (N.S. at $p<.05$). This lack of significance is again a result of the small number of data points used in the projection ($n=8$ quarter-year intervals) and the extremely high variance between the dollar values for each point in time. This high variance is evident by looking at the quarterly net loss totals as listed in Table 9. During the pre-installation period, (the basis of the cost-benefit projection) the dollar value ranged from $618 to $4,441. Although it is not statistically reliable to make projections based upon highly fluctuating data, this projection is the most realistic way of estimating future loss experience. Only time will supply the actual data needed to make a more valid cost-benefit analysis.

E. Conclusion

It is unfortunately too early to determine whether or not the primary project objective has been achieved. This goal, a 60% reduction in property loss due to burglaries over a three-year period, can only be determined if data were available through January, 1978 the end of the third post-installation year. Referring again to Table 3, it can be seen that at the end of the second post-installation year, there was a 42% decline in property loss in the target schools. If the above 60% goal is divided into three, one-year segments,

resulting in a 20% reduction per year, or a 40% reduction by the end of the second post-installation year, then the 42% actual reduction to date slightly surpasses the 40% objective. Whether or not the original 60% reduction will be obtained cannot reliably be predicted from the available data.[4]

The secondary objectives, e.g. an unspecified increase in apprehensions and an unspecified decrease in burglary frequency were met.

Figures in Table 3, p. 12, shows there was, in fact, a significant drop in burglary frequency. The figures also indicate, in the form of a proportion, that there was a statistically insignificant, but nonetheless notable, 6% increase in the burglary clearance rate. However, since the target schools were chosen because they represented, as a group, those schools with the highest incidence of burglary victimization, the effects of statistical regression may have contributed to this significant decline. Statistical regression is the tendency for groups with extremely high or extremely low values to move toward the average on subsequent measures of those values. In other words, a certain amount of extreme burglary frequency and consequent property loss may be due to chance fluctuation in those rates. These fluctuations may be due to variations in the incidence of the "actual" number of burglaries in relation to those known to the police and to chance fluctuations in any of the numerous factors which influence the burglary rate within schools.

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[4]To determine this would necessitate a projection of property loss based on available post-installation data. Such a linear projection results in a least-squares correlation coefficient of r=.50 (d.f.=n-7) which is insignificant at the .05 level.

Unfortunately, due to the lack of equivalence and non-randomization in the selection of the target schools, there is no widely accepted method to determine the degree to which statistical regression may have been a contributor to the drop in target and control school burglary rates.

Although this project to date has produced statistically and/or programmatically significant reductions in burglary frequency and property loss, and an increase in clearance rate, the ability of the system to yield financial benefits in excess of the total implementation and on-going maintenance costs remains questionable. Whether or not the anticipated potential savings in burglary and fire protection under the expanded system plan is realized cannot be determined with the available data.

Secondly, the Portland Public Schools have expanded the area served by the burglary system to another nine schools, making a total of 20 schools currently on-line. There have likely been resulting decreases in both the burglary frequency and property losses associated with burglary in these schools. Unfortunately, this data was not collected due to the fact that these additional target schools have not been on the system long enough to reliably measure the impact of the alarms, and because these additional schools were not part of those schools in the original grant.

A third factor is that along with the anti-intrusion devices installed in each of these additional schools, smoke and fire detection devices have also been installed and are being added to the original schools and to other schools as they are selected for general renovation. Although this fire protection component is not part of the original grant, it can, by detecting a potentially serious fire, save hundreds of thousands of dollars over a period of years, and resultingly pay for the cost of the system. Shortly after the smoke detection

equipment was installed in one of the target schools, King Elementary, a fire was detected by the system and subsequently contained before it could do any serious damage. If the smoke/fire detection equipment had not been installed, the loss could have been much greater than it was.

Since 42 percent of all reported elementary school fires and 64 percent of all high school fires reported in Oregon during 1975 were incendiary (arson) caused, these smoke/fire detection devices could significantly reduce the dollar loss due to deliberately set fires. (7:107-8).

APPENDICES

APPENDIX A

Target Schools

CMCS Code Number	Name of School
081	Alameda Elementary School
122	Beach Elementary School
222	Boise Elementary School
063	Creston Elementary School
224	Eliot Elementary School
024	King Elementary School
160	Madison High School
207	Portsmouth Middle School
200	Roosevelt High School
027	Vernon Elementary School
029	Woodlawn Elementary School

Control Schools

205	Astor (John Jacob Astor)
082	Beaumont Elementary School
040	Cleveland High School
022	Faubion Elementary School
243	Hayhurst (Elizabeth Hayhurst)
124	Humboldt Elementary School
085	Irvington Elementary School
120	Jefferson High School
066	Lane Elementary School
245	Multnomah Elementary School
089	Sabin Elementary School

APPENDIX B

Summary Tables
of
Burglary Frequency,
Property Loss,
Clearance Rates
and Offender Characteristics

TABLE B-1

Known Burglaries in Target and Control Schools
Baseline and Post-Alarm Period

Target Schools (T1 & T2) Name of School	Pre-installation 1973-4[1]	1974-75[2]	Post-Installation 1975-76[3]	1976-77[4]	Total
Alameda Elementary School	2	2	5	1	10
Beach Elementary School	2	2	4	4	12
Boise Elementary School	3	2	2	4	11
Creston Elementary School	2	7	2	2	13
Eliot Elementary School	9	2	3	1	15
King Elementary School	6	5	4	8	23
Madison High School	11	21	13	10	55
Portsmouth Middle School	11	7	7	3	28
Roosevelt High School	4	18	3	6	31
Vernon Elementary School	11	4	9	3	27
Woodlawn Elementary School	2	2	5	0	9
Subtotal	63	72	57	42	234
Control Schools (C1 & C2)					
Astor Elementary School	5	0	1	1	7
Beaumont Elementary School	6	0	3	4	13
Cleveland High School	3	0	5	9	17
Faubion Elementary School	3	1	3	2	9
Hayhurst Elementary School	0	4	4	2	10
Humboldt Elementary School	2	6	0	4	12
Irvington Elementary School	2	2	3	0	7
Jefferson High School	11	7	7	9	34
Lane Elementary School	1	7	5	3	16
Multnomah Elementary School	3	12	4	4	23
Sabin Elementary School	3	6	2	0	11
Subtotal	39	45	37	38	159

[1] February 1973 through January 1974
[2] February 1974 through January 1975
[3] February 1975 through January 1976
[4] February 1976 through January 1977

TABLE B-2

Property Loss Associated With Burglaries,
Target and Control Schools,
Pre and Post-Installation Period (Dollars)

Target Schools Name of School	Comparison - Years Pre-Installation 1973-1975	Post-Installation 1975-1977	Total
Alameda Elementary School	94	155	249
Beach Elementary School	515	196	711
Boise Elementary School	523	1,673	2,196
Creston Elementary School	394	27	421
Eliot Elementary School	382	290	672
King Elementary School	1,950	,985	4,935
Madison High School	8,542	3,036	11,578
Portsmouth Middle School	2,930	1,734	4,664
Roosevelt High School	7,416	618	8,034
Vernon Elementary School	1,310	3,300	4,610
Woodlawn Elementary School	724	273	997
Subtotal	$24,780	$14,287	$39,067
Control School			
Astor Elementary School	282	5	287
Beaumont Elementary School	56	1,019	1,075
Cleveland High School	112	2,114	2,226
Faubian Elementary School	29	1,779	1,808
Hayhurst Elementary School	249	1,265	1,514
Humbolt Elementary School	743	1,494	2,237
Irvington Elementary School	336	45	381
Jefferson High School	4,383	3,662	8,045
Lane Elementary School	95	378	473
Multnomah Elementary School	1,437	233	1,670
Sabin Elementary School	557	119	676
Subtotal	$8,279	$12,113	$20,392

TABLE B-3

Property Recovered From Burglaries,
Target and Control Schools,
Pre and Post-Installation Periods (Dollars)

Target Schools Name of School	Comparison - Years Pre-Installation 1973-1975	 Post-Installation 1975-1977	Total
Alameda Elementary School	7	146	153
Beach Elementary School	30	78	108
Boise Elementary School	117	1,482	1,599
Creston Elementary School	195	0	195
Eliot Elementary School	0	250	250
King Elementary School	432	78	510
Madison High School	2,391	1,911	4,302
Portsmouth Middle School	1,661	0	1,661
Roosevelt High School	5,148	60	5,208
Vernon Elementary School	428	107	535
Woodlawn Elementary School	0	50	50
Subtotal	$10,409	$4,162	$14,571
Control School			
Astor Elementary School	152	0	152
Beaumont Elementary School	0	342	342
Cleveland High School	0	58	58
Faubian Elementary School	0	0	0
Hayhurst Elementary School	110	583	693
Humbolt Elementary School	0	0	0
Irvington Elementary School	0	0	0
Jefferson High School	511	0	511
Lane Elementary School	0	0	0
Multnomah Elementary School	0	0	0
Sabin Elementary School	0	0	0
Subtotal	$773	$983	$1,756

TABLE B-4

BURGLARY FREQUENCY AND CLEARANCE RATIO,
TARGET AND CONTROL SCHOOLS

	Target - Schools		Control - Schools	
	Pre Installation	Post Installation	Pre Installation	Post Installation
Burglary Frequency	135	99	84	74
Arrest Frequency*	59	49	10	14
Clearance Ratio	.44	.50 (+.06)	.12	.18 (+.06)

* This figure includes all burglaries where at least one individual was arrested. Actual number of offenders exceeds this number.

TABLE B-5

Burglary Clearance Rates
Target and Control Schools
Pre and Post-Installation Periods

Target School Name of School	Comparison - Years Pre-Installation 1973-1975	Post-Installation 1975-1977	Pre & Post Average
Alameda Elementary School	.50	1.00	.75
Beach Elementary School	.25	.88	.57
Boise Elementary School	.20	.83	.52
Creston Elementary School	.33	.25	.29
Eliot Elementary School	.55	.25	.40
King Elementary School	.18	.50	.34
Madison High School	.38	.39	.385
Portsmouth Middle School	.67	.20	.435
Roosevelt High School	.50	.44	.47
Vernon Elementary School	.47	.17	.32
Woodlawn Elementary School	.50	1.00	.75
Mean	.44	.50	.47
Control Schools			
Astor Elementary School	.40	.50	.45
Beaumont Elementary School	.17	.43	.30
Cleveland High School	.00	.21	.11
Faubian Elementary School	.00	.20	.10
Hayhurst Elementary School	.25	.166	.21
Humbolt Elementary School	.00	.00	.00
Irvington Elementary School	.13	.00	.065
Jefferson High School	.17	.125	.148
Lane Elementary School	.00	.38	.19
Multnomah Elementary School	.00	.00	.00
Sabin Elementary School	.22	.00	.11
Mean	.12	.18	.15

TABLE B-6

Reported Burglaries Per Month**

	1973-1975				1975-1977			
	Target		Control		Target		Control	
	N	%	N	%	N	%	N	%
January	15	11	7	8	4	4	4	5
February	10	7	6	7	11	11	13	17
March	11	8	11	13	13	13	7	9
April	6	4	7	8	11	11	3	4
May	13	10	14	17	13	13	6	8
June	13	10	6	7	5	5	10	13
July	6	4	4	5	7	7	9	12
August	7	5	5	6	3	3	5	7
September	12	9	5	6	7	7	5	7
October	8	6	8	10	11	11	3	4
November	13	10	5	6	10	10	4	5
December	21	16	6	7	4	4	5	7
	135	100%	84	100%	99	100%	74*	100%
Mean	5.6		3.5		4.1		3.1	

*Does not include one case with unknown month.

**Numbers listed are the number of burglaries occurring by month over a two-year period. Means were corrected for this by dividing the total for each column by 24 (months) rather than by 12 (months).

TABLE B-7

Burglaries Per Month in Target and Control Schools
Combined-February, 1973, through January, 1977

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
30	40	42	27	46	34	26	20	29	30	32	36

N= 392* X^2 = 24.28, sig. $<$.025, d.f.=11

*Excludes one case with unknown month.

TABLE B-8

Burglaries By Day of Week in Target and Control Schools
Combined--February, 1973 through January, 1977

Day of Week	N	%	
Monday	37	9.4	** Contains burglaries committed on Fridays after 12 p.m. and on Mondays before 6:00 a.m.
Tuesday	32	8.1	
Wednesday	40	10.2	
Thursday	47	12.0	
Friday	43	10.9	N=392
Total Weekend**	187	47.8	X^2 =378.85, d.f.=6
Unknown	6	1.5	sig. $<$.001
	392*	100%	

*Excludes one case with unknown day

TABLE B-9

Time of Occurrence by Hour
Combined Target and Control Schools

TIME	N	PERCENT
0000-0059	16	4.1
0100-0159	21	5.3
0200-0259	9	2.3
0300-0359	6	1.5
0400-0459	5	1.3
0500-0559	6	1.5
0600-0659	6	1.5
0700-0759	4	1.0
0800-0859	0	0
0900-0959	2	.5
1000-1059	6	1.5
1100-1159	3	.7
1200-1259	7	1.8
1300-1359	2	.5
1400-1459	8	2.0
1500-1559	9	2.3
1600-1659	7	1.8
1700-1759	15	3.8
1800-1859	10	2.5
1900-1959	11	2.8
2000-2059	13	3.3
2100-2159	6	1.5
2200-2259	15	3.8
2300-2359	20	5.0
	207	52.8
Unknown times	186	47.2
Total	393	100.0

TABLE B-10

Burglaries By School Time Periods
Combined Target and Control Schools

1973-1977		
Time Period	N	Percent
Holiday or Weekend	183	46.5
Summer Vacation	79	20.0
School in Session	125	31.8
Unknown	7	1.7
Total	393	100.0

TABLE B-11

Property Loss In Target and Control Schools
By Day of Week
Pre and Post-Installation Periods Combined

Day of Week	Target Schools	%	Control School	%
Monday	6,886	17.6	2,443	12.0
Tuesday	1,509	3.8	1,426	7.0
Wednesday	5,808	14.8	1,295	6.4
Thursday	4,076	10.4	5,392	26.4
Friday	4,759	12.1	2,400	11.8
Weekend	16,025	41.0	6,564	32.2
Unknown	-	-	872	4.2
Total	39,063	100%	20,392	100%

TABLE B-12

Types of Property Stolen By School Group,
Pre and Post-Installation

Property Type	T1		T2		C1		C2	
	N	%	N	%	N	%	N	%
Money	14	10.4	5	5	6	7.1	3	4
Audio Visual	24	17.8	16	16	7	8.3	9	12
Business Machines	5	3.7	5	5	9	10.7	4	5.3
Musical Instruments	3	2.2	0	0	0	0	3	4
Tools	3	2.2	2	2	1	1.2	1	1.3
Sports Equipment	2	1.5	0	0	1	1.2	2	2.7
Personal Property	3	2.2	5	5	0	0	2	2.7
Other	26	19.3	18	18	18	21.4	5	6.7
Unknown or nothing stolen	55	40.7	48	48	42	50.0	46	61.3
Total	135	100%	99	100%	84	100%	75	100%

TABLE B-13

Dollar Loss Due to Burglary by School Group,
Pre and Post-Installation Periods

Dollar Category	T1		T2		C1		C2	
	N	%	N	%	N	%	N	%
No Loss	48	35.5	25	25	28	33.3	19	25.3
1-499	77	57	65	66	53	63.1	58	64.0
500-999	4	2.9	8	8	2	2.4	5	6.7
1,000-1,499	2	1.5	1	1	0	0	2	3.0
1,500-1,999	1	.7	0	0	1	1.2	1	1.0
2,000-2,499	2	1.5	0	0	0	0	0	0
2,500-2,999	1	.7	0	0	0	0	0	0
Total	135	100%	99	100%	84	100%	75	100%

TABLE B-14

Age Distribution by Target Group
Pre and Post Periods Combined, and
Control Group, Pre and Post Periods Combined

	Target		Control		
	AGE	N	%	N	%	
	7	5	1.6	0	0	
	8	7	2.4	2	3.1	
	9	7	2.4	0	0	
	10	14	4.7	5	7.9	
	11	16	5.4	4	6.4	
	12	25	8.4	6	9.5	
	13	49	16.6	8	12.7	
	14	29	9.8	10	15.8	
	15	29	9.8	6	9.5	
	16	23	7.8	4	6.4	
	17	34	11.5	8	12.7	
	18	18	6.1	2	3.1	
	19	3	1.0	1	1.6	
	20	5	1.6	3	4.8	
	21	10	3.3	1	1.6	
	22	2	.7	0	0	
Target	23	2	.7	0	0	Control
	24	0	0	0	0	
Mean=14.4	25	0	0	0	0	Mean=14.6
Mode=13	26	2	.7	0	0	Mode=14
Standard	27	0	0	0	0	Standard
Deviation=3.5	28	0	0	0	0	Deviation=4.1
Range=24	29	0	0	0	0	Range=28
	30	0	0	0	0	
	31	1	.7	0	0	
	32	0	0	0	0	
	33	0	0	0	0	
	34	0	0	0	0	
	35	0	0	0	0	
	36	0	0	1	1.6	
	Unknown	15	5.0	2	3.1	
	Total	296	100%	63	100	

*This distribution includes the ages of the offenders per crime cleared, and therefore includes the same individual's age more than once if that person was arrested for multiple burglaries.

TABLE B-15

Sex and Ethnicity of Offenders
Pre and Post-Installation Periods Combined
by Target and Control Schools *

Sex	Target N	Target %	Control N	Control %
Male	275	92.9	58	92
Female	10	3.4	5	8
Unknown	11	3.7	0	0
Total	296	100%	63	100%

Ethnicity	Target N	Target %	Control N	Control %
Caucasian	158	53.4	46	73
Black	114	38.5	15	23.8
American Indian	4	1.4	0	0
Unknown	20	6.7	2	3.2
Total	296	100%	63	100%

*This distribution includes the sex and ethnicity of the offenders per crime cleared, and therefore includes the same individual's sex and ethnicity more than once if that person was arrested for multiple burglaries.

TABLE B-16

School Enrollment Status of Offenders,
Pre and Post Periods Combined,
By Target and Control Schools

Enrollment Status	Target		Control	
	N	%	N	%
Enrolled	216	73	44	69.8
Not Enrolled	19	6.4	3	4.8
Not Applicable	29	9.8	6	9.5
Unknown	32	10.8	10	15.9
Total	296	100%	63	100%
Elementary	124	42	25	39.7
Secondary	85	28.6	17	27.0
Not Applicable	34	11.5	8	12.7
Unknown	53	17.9	13	20.6
Total	296	100%	63	100%

* This distribution includes the enrollment status of the offenders per crime cleared and therefore includes the same individual's enrollment status more than once if that person was arrested for multiple burglaries.

Appendix C

Sources of Demographic Data

The socio-economic and familial data for the pre-installation period, February 1973, through January 1975, is taken from 1971-72 or 1972-73 data gathered and computed from various school surveys as listed by school in a Portland Public School document entitled Achievement Profiles, dated September, 1973. The demographic data for the post-installation period, February 1975, through January 1977, is taken from 1974-75 or 1975-76 school year data compiled in similar school surveys and listed in the June, 1976 edition of Achievement Profiles.

The Student/Teacher Ratio- This ratio of students to certified teachers was found by dividing the number of students enrolled by the number of full-time-equivalent teachers (FTE) for each of the respective time periods. This data was gathered by the office of Management Information Services.

The Percent Student Mobility- This measure was found by dividing the total enrollment minus the average daily membership by the total enrollment. The source of this data is the Summary of Pupil Personnel compiled by the Deputy Clerk.

The Percent of Student Attendance- This percentage was calculated by dividing the average daily attendance by the average daily membership. This results in a fairly accurate picture of the number of students present on an average day. This data was gathered from the office of the Deputy Clerk.

The Percent Welfare Families- This statistic shows the percent of students in each school whose families were receiving Aid to Families with Dependent Children and was obtained from the annual A.D.C. Report for School District No. 1.

The Percent Receiving Free Lunches - The average number of students receiving free lunches was included as an added indication of economic need in the families in each of the schools. These figures were derived from the Inventory of School Food Services for the year 1971-72 and the Cafeteria Meal Value and Control Report for October, 1975.

The Percent of Students Coming from Two-Parent Families - This percentage was calculated from the 1970 Census of Population and Housing: Census Tracts Portland, Oregon - Washington, U.S. Department of Commerce and were adjusted to reflect an estimated 2.78 percent decrease per five-year period in the national percent of families comprised of both husband and wife.

The Parent's Median Level of Education in Years - This figure included all parents 25 years of age or older and was gathered from 1970 census data adjusted to take into account the 1.64 percent estimated five-year increase in the national median grade completed for adults.

The Median Family Income - This measure of income was compiled from the 1970 Census and was adjusted to the estimated 38.8 percent five-year increase in Oregonian's median income.

The Percent Caucasian - This figure was taken from the Oregon Department of Education Elementary and High School Fall 1975 and October, 1972 Enrollment Report prepared by the Management Information Office. (6:229-232) (7:16-21)

Appendix D

The Association Between Certain Socio-economic and Familial Factors with Burglary Frequency and Property Loss

In Section III of this report, several socio-economic factors were used as one method of determining the equivalence of the target and control groups. To carry this one step further, multiple stepwise regression was employed to measure the degree of association between a set of independent variables (the demographic variables) and a dependent variable (burglary frequency or property loss).

This technique is also useful in arriving at a formula based on this association which can then be used to predict the burglary frequency and/or property loss given a school's value on each of the independent variables in the prediction formula.

Tables D-1 and D-2 show the significance of each of the variables in the regression analysis. This particular method of analysis is termed the "standard regression method" where each variable is added in a separate step, one-by-one until all variables are added to the mix and each variable's direct association with the dependent variable is calculated.

From the last column of each of these tables it can be seen that only the percentage of student attendance proved to have a significant association with both the burglary frequency and property loss in all twenty-two schools combined over the pre- and post-installation periods combined. This result suggests that considering the separate contribution of each of the variables toward "explaining" variations in both burglary frequency and property loss, only the student attendance shows a strong and statistically significant association with those two criterion measures. Little strength is added to this association when the other seven variables are brought into the analysis.

TABLE D-1

Multiple Regression F - Ratios
of Demographic Variable's Association
With Burglary Frequency,
All Schools and Periods Combined

Variable	F-Ratio*	Significance	Simple r
% Attendance	11.319	<.01	-.54
% Caucasian	1.343	N.S.**	.13
% Receiving Welfare	1.901	N.S.	-.01
% Student Mobility	.690	N.S.	-.10
Median Parental Education	1.856	N.S.	.05
Median Parental Income	.549	N.S.	-.03
% Receiving Free lunch	.473	N.S.	.21
Student/Teacher Ratio	.017	N.S.	.12
% Two Parent Families	.002	N.S.	.01

* N-44 (11 Target Schools plus 11 Control Schools X 2 time periods)
** N.S.-Not Statistically significant

TABLE D-2

Multiple Regression F - Ratios
of Demographic Variable's Association
With Property Loss,
All Schools and Periods Combined

Variable	F-Ratio	Significance	Simple r
% Attendance	19.6	<.01	-.60
% Student Mobility	.642	N.S.	-.12
% Receiving Free lunch	.605	N.S.	.18
Median Parental Education	1.794	N.S.	-.02
% Two-parent Families	.885	N.S.	-.09
Median Family Income	.536	N.S.	-.10
% Caucasian	1.238	N.S.	.07
% Receiving welfare	.550	N.S.	-.01
Student/Teacher Ratio	.405	N.S.	.02

The actual correlation between attendance and burglary frequency is -.54, indicating a significant association between these two variables. The minus (-) sign indicates an inverse relationship, in that the higher a school's attendance record the lower will be its burglary frequency. The chance of this relationship existing solely by chance is less than one in one thousand. However, attendance alone only "explains" 29 percent of the variation in burglary frequency. When the other eight variables are added to the regression analysis, a total of 41 percent of the variation in burglary frequency is "explained", or is directly associated with burglary frequency.

The strength of association between attendance and dollar value of property loss is greater than in the case of attendance's correlation with burglary frequency. Here the correlation between attendance alone and property loss is -.60 "explaining" 36 percent of the variance in property loss. As would be expected, this correlation is negative, so that the higher the average percentage of students attending school, the lower will be that school's property loss due to burglary. The probability of this correlation being due to chance is less than one in one thousand.

The relationship between truancy and delinquency has been noted for decades. Because the public school plays such a strong and enduring role in the formation of a child's attitudes and behavior, the breakdown in the continuity of instruction can have the effect of developing anti-social trends amongst those who, for whatever reason, become averse to school.

Travis Hirschi writes that:

> The 'criminogenic' effect of attitudes toward school is sometimes held to depend upon why the student does not like school. In other studies, 'attitudes toward school' has drifted to the point that it is no longer a cause of delinquency but is instead part of the descriptive characterization of the delinquent; delinquents do not like school. In general, however, it may be said that dislike for school is usually seen as a source of motivation to delinquency. Delinquency is a means of relieving frustration generated by unpleasant school experience. (4:122)

Cavan and Ferdinand further write that:

> Truancy per se does not inevitably lead to delinquency. But the high percentage of truants among delinquents probably indicates a tendency common to both, i.e., an inability to fit into an orderly, regulated pattern of life. (2:264)

Although the relationship between truancy and burglary rates is significant, the truancy factor is itself probably a consequence of something more close to the child's family situation. In an early study of truancy in Omaha, Nebraska, in 1930-32, of 1,741 truant cases, it was found that the main cause of nonattendance was non-cooperative parents and lack of home supervision. (9:369)

Truancy is no doubt influenced by a variety of other factors; one of which is the fact that the model age group, both in the Omaha study just cited and in the current study, is 13-16 years of age--an age group most identified with a desire for independence, somethimes manifested by outright attacks on external constraints.

In reference to the age of the current sample of burglary offenders, there exists a bi-model curve in the number of juveniles arrested, both in the target and in the control schools. Table B-14 in Appendix B shows that the most frequent age of arrest for the target school offenders was 13. The second most frequent age was 17. In the control schools, the model age was 14 with secondary peaks at ages 13 and 17. With this sample at least, it seems that the ages of 13 or 14 and 17 are most related to the frequency of arrest than any other age group. One possible explanation for this phenomenon is that the age of 13 for grade school children and the age of 17 for high school students represents critical years in their development; periods where the pressures of making career and social-sexual identity choices can cause those so predisposed to resort to burglary and vandalism as a reaction to or as a means of coping with these demands.

Appendix E

Statistical Formulas

For all comparisons in this study where t-tests are the basis of inference, the F-statistic was used to determine the degree of homogeniety of variance between the two samples to be compared.

If F obtained exceeded 3.79 (d.f. = N-1 = 8 - 1 = 7, p. <.05) the following statistic was employed.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\hat{\sigma}_{\bar{X}_1 - \bar{X}_2}}$$

where,

$$\hat{\sigma}_{X_1 - X_2} = \sqrt{\frac{S_1^2}{N_1 - 1} + \frac{S_2^2}{N_2 - 1}}$$

and,

$$d.f. = \frac{\left[s_1^2 / (N_1 - 1) + s_2^2 / (N_2 - 1) \right]^2}{\left[s_1^2 / (N_1 - 1) \right]^2 1/(N_1 + 1) + \left[s_2^2 / (N_2 - 1) \right]^2 1/(N_2 + 1)} - 2$$

The above t formula from Blalock (1:175) takes into account the separate variances of the two groups rather than the pooled variance.

If, however, F-obtained was insignificant (indicating homogeneous variance) and the comparison was a between-group test ($T_1 - C_1$) the t-statistic for independent samples was used:

$$t_{ind.} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\frac{(N_1-1)\ s_1^2 + (N_2-1)\ s_2^2}{N_1 + N_2 - 2}\right]\left[\frac{1}{N_1} + \frac{1}{N_2}\right]}}$$

If F obtained was insignificant, and the comparison was a within-group ($T_1 - T_2$ or $C_1 - C_2$) pre-post-installation comparison the following t-statistic was used.

$$t\ dep. = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{SD_x^2\ SD_y^2 - 2r\left[(SD_x)(SD_y)\right]}{N}}}$$

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